Provisional Landsat 8 Surface Reflectance Code (LaSRC)

U.S. Geological Survey (USGS)

Earth Resources Observation and Science Center (EROS)

Sioux Falls, South Dakota, U.S.A.

LaSRC Release Notes

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LaSRC 0.9.0 (October 26, 2016 – USGS EROS)

Overall

- Modified the cloud QA to contain the cloud and aerosol information in one 16-bit band for Collection products. Pre-Collection products will continue to have two 8-bit QA bands, one for the cloud band and the other for the aerosol band.
- Fixed a bug in the do_lasrc.py script to correctly handle the new Collection naming convention.
- Modified how the bits are set in the cloud masks by using a bit shift and an OR with the existing bits.

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LaSRC 0.8.0 (July 29, 2016 – USGS EROS)

Overall

- Updated the valid_range to be a floating point versus long to match the new data type in the XML schema.
- Change scene_id to product_id in the output XML to match the new schema.
- Verified the code supports Albers for CONUS, Hawaii, and Alaska.
- Verified the code support for the new 4-character product type collection filenames.
- Fixed a bug in the per-pixel interpolation of the auxiliary input data. The pixel location in the CMG-level auxiliary products should not be rounded when going from Landsat pixel to CMG pixel. The interpolation of the auxiliary values is based on the pixel value being truncated versus rounded.

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LaSRC 0.7.0 (May 16, 2016 – USGS EROS)

Overall

- Updated the FORTRAN code to be the latest version (v3.0) of software received from NASA GSFC for LaSRC.
    - Band ratios are interpolated at the pixel level versus the CMG level, which helps solve the blockiness results from the previous algorithm.
    - Aerosols are not retrieved over cirrus pixels, however they are retrieved for all other non-fill pixels (including water). The results of the aerosol retrieval are tested and flagged if the retrieval does not meet residual and NDVI criteria. These flagged pixels are attempted to be interpolated via aerosol interpolation. Cirrus, cloud, and water pixels are not used as part of the interpolation. The aerosol interpolation process has changed and allows the results of the interpolation to be at the pixel level versus a block level. The final

step is to perform the atmospheric correction based on the calculated or interpolated aerosols. This level of correction is not applied to cirrus or cloud pixels.

- Updated the C version of the LaSRC code to include the modifications delivered as part of v3.0 of the FORTRAN source code.
- Merged in changes from version 0.6.1 and 0.6.2 for the updatelads.py script.

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LaSRC 0.5.0 (March 02, 2016 – USGS EROS)

Overall

- Updated to support the new L1T file naming convention.
- Modified the LaSRC script to handle OLI-only scenes in addition to the OLI-TIRS scenes.

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LaSRC 0.4.0 (December 03, 2015 – USGS EROS)

Overall

- Updated scripts to use Python logging (originally print statements).
- Added a command-line option for specifying the username and password for updatelads.py. If the username and password are specified, then they are used. Otherwise the script tries to pull the username and password from our ESPA remote procedure calls (XMLRPC).
- Modified the interpolation code for ozone, water vapor, and DEMs to wrap around the dateline in the event the scene straddles -180, 180 line or -90, 90 pole.
- Removed --usebin from do_ledaps.py as the LEDAPS executables are expected to be in the PATH.
- Updated the Makefile.
- Updated RPM support.
- Provided top-level surface-reflectance script helper for ESPA processing.

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LaSRC 0.3.1 (September 28, 2015 – USGS EROS)

Overall

- Fixed a bug accessing the 9x9 window in the land/water mask array. We were accessing invalid memory if the window was on the edges of the scene.
- Fixed a bug accessing the CMG arrays for line+1 and sample+1. We were accessing invalid memory if the scene was at the right or bottom edge of the CMG array.
- Modified the update auxiliary files script (updatelads.py) to retry the file download in the event the wget fails. Cleaned up a few logger issues in this script as well.
- Float to integer conversions previously added 0.5 to the float before converting to integer. That was only correct for positive values. The source code now uses round to correctly round the floating point values up or down.

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LaSRC 0.3.0 (May 13, 2015 – USGS EROS)

Overall

- Updated to utilize the static land/water mask. This is only used for computing the surface reflectance. Thus it will not be used for OLI-only scenes.
- Updated the TOA reflectance and BT computations to use the radiance/reflectance/thermal constants and earth-sun distance from the XML file.

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LaSRC 0.2.0 (March 16, 2015 – USGS EROS)

Overall

- Modularized the L8 SR application to break up the code into more readable pieces. In particular, broke out the TOA reflectance calculations and the surface reflectance calculations.
- Isolated the SR-related memory allocations, read from lookup tables, and read of auxiliary data to the compute_sr_refl function. This should minimize the amount of time needed to process TOA (if only TOA is selected) due to no longer needing to read lookup tables and auxiliary data.
- Comparison between SR products generated with LaSRC 0.1.0 and 0.2.0 will show a small number of differences on the order of 10 or less (usually between -1 and 1), due to round-off differences. The variables are local to the function now and aren't passed in.
- Modified LaSRC to address a couple of issues with blockiness along the coastlines and within the forested regions. This includes treating adjacent water pixels as water until the ndvi < 0.1 check confirms it isn't water.
- Changed the aerosol interpolation to use a step x step window surrounding the current pixel vs. the step x step window to the southeast of the current pixel, where the pixel is the UL corner of the step x step window.

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LaSRC 0.1.0 (December 23, 2014 – USGS EROS)

Overall

- Converted original FORTRAN code to C.
- Modified the code to support ESPA raw binary file format for input and output image products.
- Added documentation to the source code.
- Made some modifications for efficiency in the code processing.
- All int16 bands use -9999 for the output fill value, which is a modification for most of the bands.
- Switched the use of xmus and xmuv in the calls to local_chand, since they were being sent in the incorrect order. This doesn't have much impact on the outputs, due to the nature of the algorithms and how those variables are used.
- Implemented modifications to achieve code speed-ups.
- Modified the code to allow the user to specify whether the TOA values should be output in addition to the SR values.
- Modified to stop after the TOA corrections if the sun angle is too low.
- Modified to stop after TOA corrections if this is an OLI-only scene.